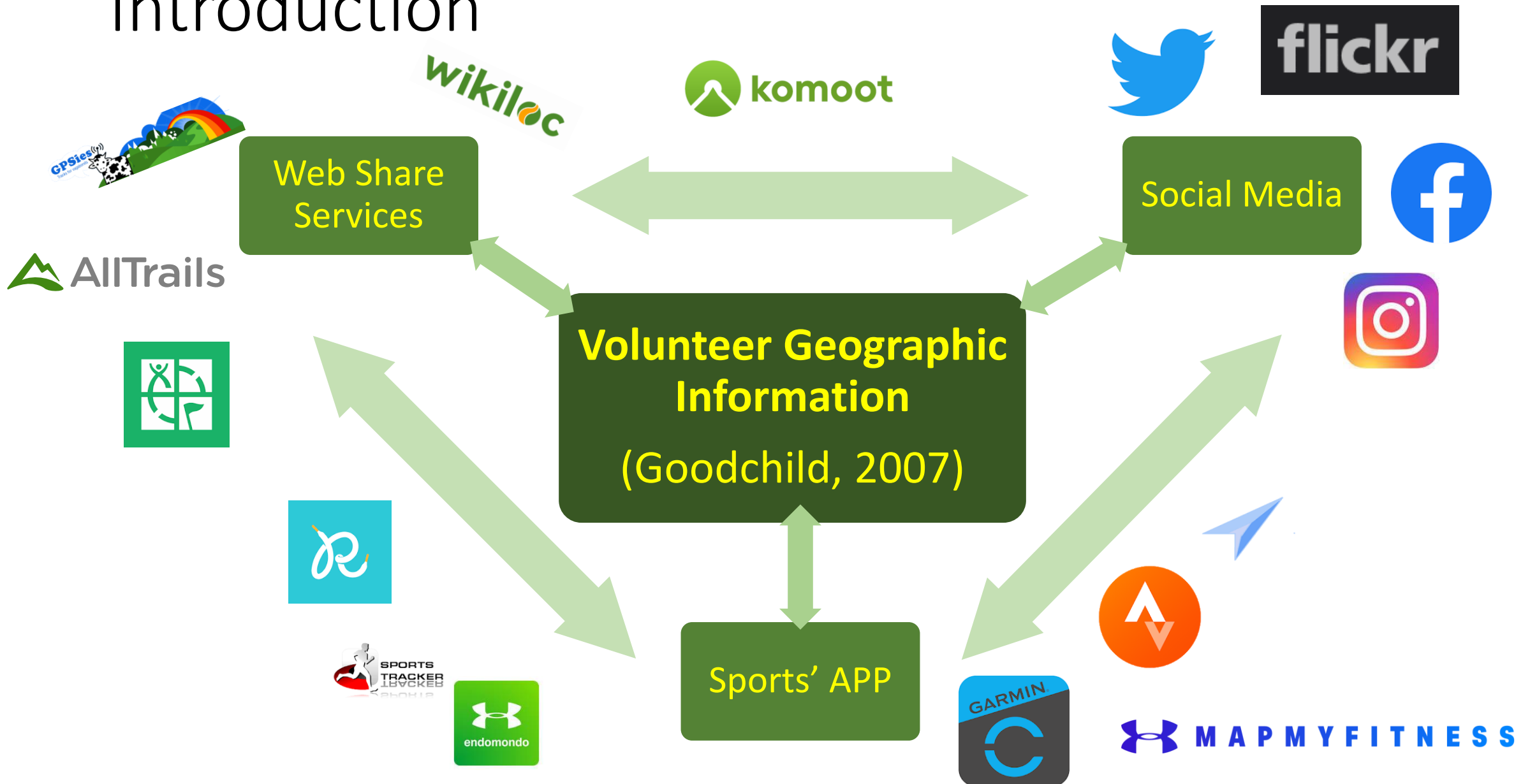


# Monitoring outdoor recreational uses through our collective digital footprint

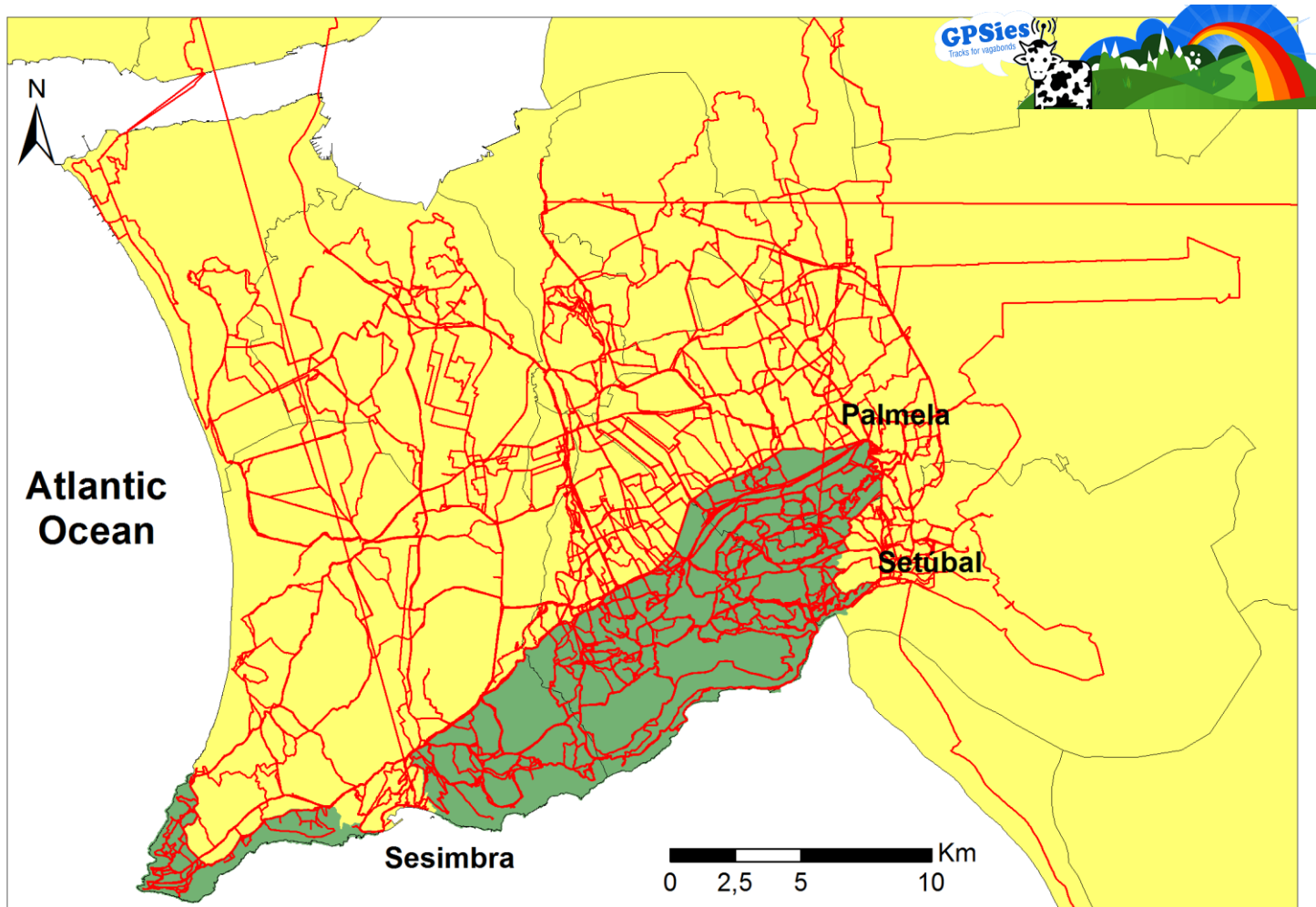
Ricardo M. Nogueira Mendes



# Introduction



# Where it all started... Case study 1



## The 6<sup>th</sup> International Conference on Monitoring and Management of Visitors in Recreational and Protected Areas

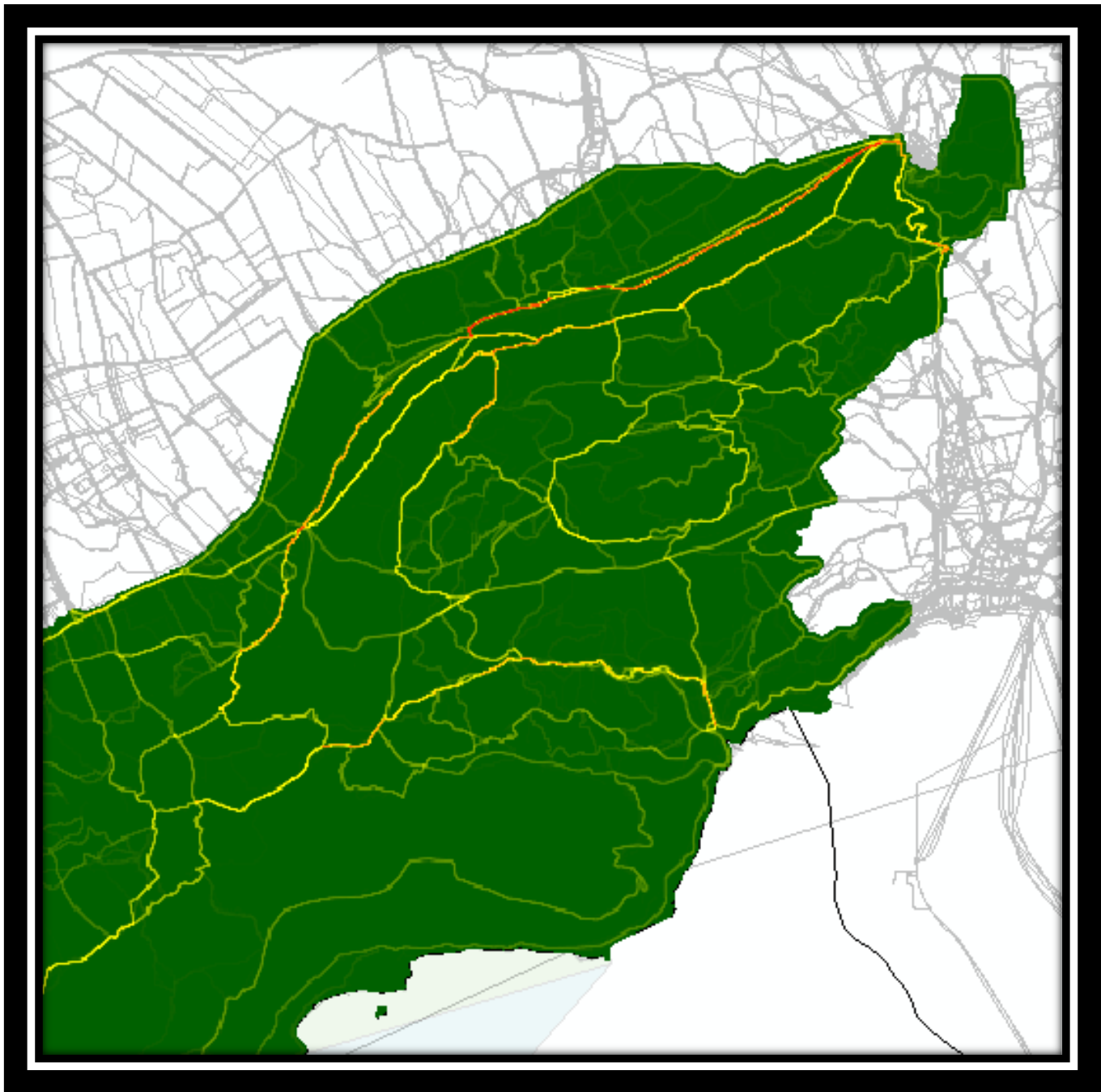
Outdoor Recreation in Change  
– Current Knowledge and Future Challenges

Stockholm, Sweden, August 21–24, 2012

Nogueira Mendes, R., Silva, A., Grilo, C., Rosalino, L. M., & Pereira da Silva, C. (2012). MTB Monitoring in Arrábida Natural Park, Portugal. In P. Fredman, M. Stenseke, H. Liljendahl, A. Mossing, & D. Laven (Eds.), *The 6th International Conference on Monitoring and Management of Visitors in Recreational and Protected Areas (MMV)* (pp. 32–33). Stockholm. ISBN 9789949291625

First results...

Displacement  
Use Intensity



First results...

Displacement  
Use Intensity

&

Informal/  
Illegal use





Contents lists available at [ScienceDirect](#)

## Journal of Outdoor Recreation and Tourism

journal homepage: [www.elsevier.com/locate/jort](http://www.elsevier.com/locate/jort)



### Research Note

## Comparing webshare services to assess mountain bike use in protected areas



Maria B. Campelo<sup>a,\*</sup>, Ricardo M. Nogueira Mendes<sup>b</sup>

<sup>a</sup> Faculdade de Ciências da Universidade de Lisboa, Departamento de Biologia Animal, Campo Grande, 1749-016 Lisboa, Portugal

<sup>b</sup> Centro Interdisciplinar de Ciências Sociais, Faculdade de Ciências Sociais e Humanas, Universidade Nova de Lisboa, Av. De Berna 26 C, 1069-061 Lisboa, Portugal



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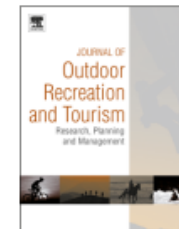
Contents lists available at ScienceDirect

Journal of Outdoor Recreation and Tourism 15 (2016) 1–9

Contents lists available at ScienceDirect

## Journal of Outdoor Recreation and Tourism

journal homepage: [www.elsevier.com/locate/jort](http://www.elsevier.com/locate/jort)



Maria B. Recreational activities in urban parks: Spatial interactions among users



<sup>a</sup> Faculdade de T. Santos <sup>a,\*</sup>, R. Nogueira Mendes <sup>a</sup>, A. Vasco <sup>b</sup>

<sup>b</sup> Centro Interdi  
Lisboa, Portuga

<sup>a</sup> CICS.NOVA Interdisciplinary Centre of Social Sciences, Faculdade de Ciências Sociais e Humanas (FCSH), Universidade Nova de Lisboa, Avenida de Berna,  
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<sup>b</sup> cE3c | Centro de Ecologia, Evolução e Alterações Ambientais/Faculdade de Ciências da Universidade de Lisboa, Portugal



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<sup>b</sup> cE3c | Centro c

Using volunteered geographic information to assess park visitation:  
Comparing three on-line platforms

Patrick Norman<sup>\*</sup>, Catherine Marina Pickering

Griffith University, Australia

Contents lists available at ScienceDirect

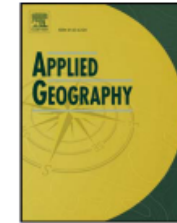
Journal of Outdoor Recreation and Tourism 15 (2016) 1–9

Applied Geography 89 (2017) 163–172

Contents lists available at ScienceDirect

Applied Geography

journal homepage: [www.elsevier.com/locate/apgeog](http://www.elsevier.com/locate/apgeog)





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Applied Geography 89 (2017) 163–172

Applied Geography 90 (2018) 44–54



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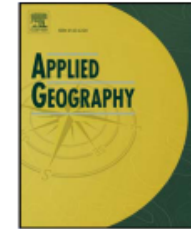


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Contents lists available at ScienceDirect

Applied Geography

journal homepage: [www.elsevier.com/locate/apgeog](http://www.elsevier.com/locate/apgeog)



## Digital footprints: Incorporating crowdsourced geographic information for protected area management

Chelsey Walden-Schreiner<sup>a,b,\*</sup>, Yu-Fai Leung<sup>a,b,c</sup>, Laura Tateosian<sup>b,c</sup>

<sup>a</sup> North Carolina State University, Dept. of Forestry & Environmental Resources, Campus Box 8008, Raleigh, NC, 27695, USA

<sup>b</sup> North Carolina State University, Dept. of Parks, Recreation, & Tourism Management, Campus Box 8004, Raleigh, NC, 27695, USA

<sup>c</sup> North Carolina State University, Center for Geospatial Analytics, Campus Box 7106, Raleigh, NC, 27695, USA



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<sup>a</sup> North Caroli  
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<sup>c</sup> North Caroli

Inês T. Rosário<sup>a,\*</sup>, Rui Rebelo<sup>a</sup>, Paulo Cardoso<sup>b</sup>, Pedro Segurado<sup>c</sup>, Ricardo Nogueira Mendes<sup>d</sup>,  
Margarida Santos-Reis<sup>a</sup>

<sup>a</sup> cE3c – Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências da Universidade de Lisboa, Campo Grande, 1749-016 Lisboa, Portugal

<sup>b</sup> Bioinsight Lda, Rua Antero de Quental 52-B, 2675-690 Odivelas, Lisboa, Portugal

<sup>c</sup> Centro de Estudos Florestais, Instituto Superior de Agronomia, Universidade de Lisboa, Tapada da Ajuda, 1349-017 Lisboa, Portugal

<sup>d</sup> Centro Interdisciplinar de Ciências Sociais CICS.NOVA – Faculdade de Ciências Sociais e Humanas – Universidade Nova de Lisboa (CICS.NOVA.FCSH/UNL), Avenida de  
Berna, 26 C, 1069-061 Lisboa, Portugal

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Applied Geography 90 (2018) 44–54

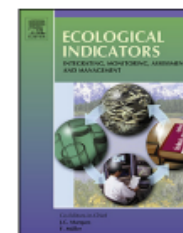
Contents lists available at ScienceDirect

Ecological Indicators 99 (2019) 375–386

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Ecological Indicators

journal homepage: [www.elsevier.com/locate/ecolind](http://www.elsevier.com/locate/ecolind)





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<sup>a</sup> cE3c – Ce  
<sup>b</sup> Bioinsight  
<sup>c</sup> Centro de  
<sup>d</sup> Centro Int  
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Journal of Outdoor Recreation and Tourism 15 (2016) 1–9

Applied Geography 89 (2017) 163–172

Applied Geography 90 (2018) 44–54

Contents lists available at ScienceDirect

Ecological Indicators 99 (2019) 375–386

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Ecological Indicators

Journal of Outdoor Recreation and Tourism 29 (2020) 100252

Contents lists available at ScienceDirect

Journal of Outdoor Recreation and Tourism

journal homepage: [www.elsevier.com/locate/jort](http://www.elsevier.com/locate/jort)



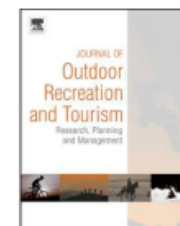
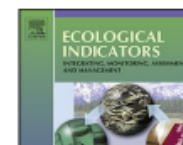
Using social media images and text to examine how tourists view and value the highest mountain in Australia

Catherine Pickering<sup>a,\*</sup>, Walden-Schreiner Chelsey<sup>1</sup>, Agustina Barros<sup>b</sup>, Sebastian Dario Rossi<sup>c</sup>

<sup>a</sup> Griffith School of Environment and Science, Gold Coast Campus, Parklands Drive, Southport, QLD, 4222, Australia

<sup>b</sup> Instituto Argentino de Nivología y Glaciología y Ciencias Ambientales (IANIGLA), Centro Científico Tecnológico (CCT) CONICET, Mendoza, Argentina

<sup>c</sup> Desertification and Land Management Laboratory (LaDyOT), CONICET, Mendoza, Argentina



Results have shown:

**where**, when, and (sometimes) **how** PPA are **used**

providing **valuable information** for managers and researchers

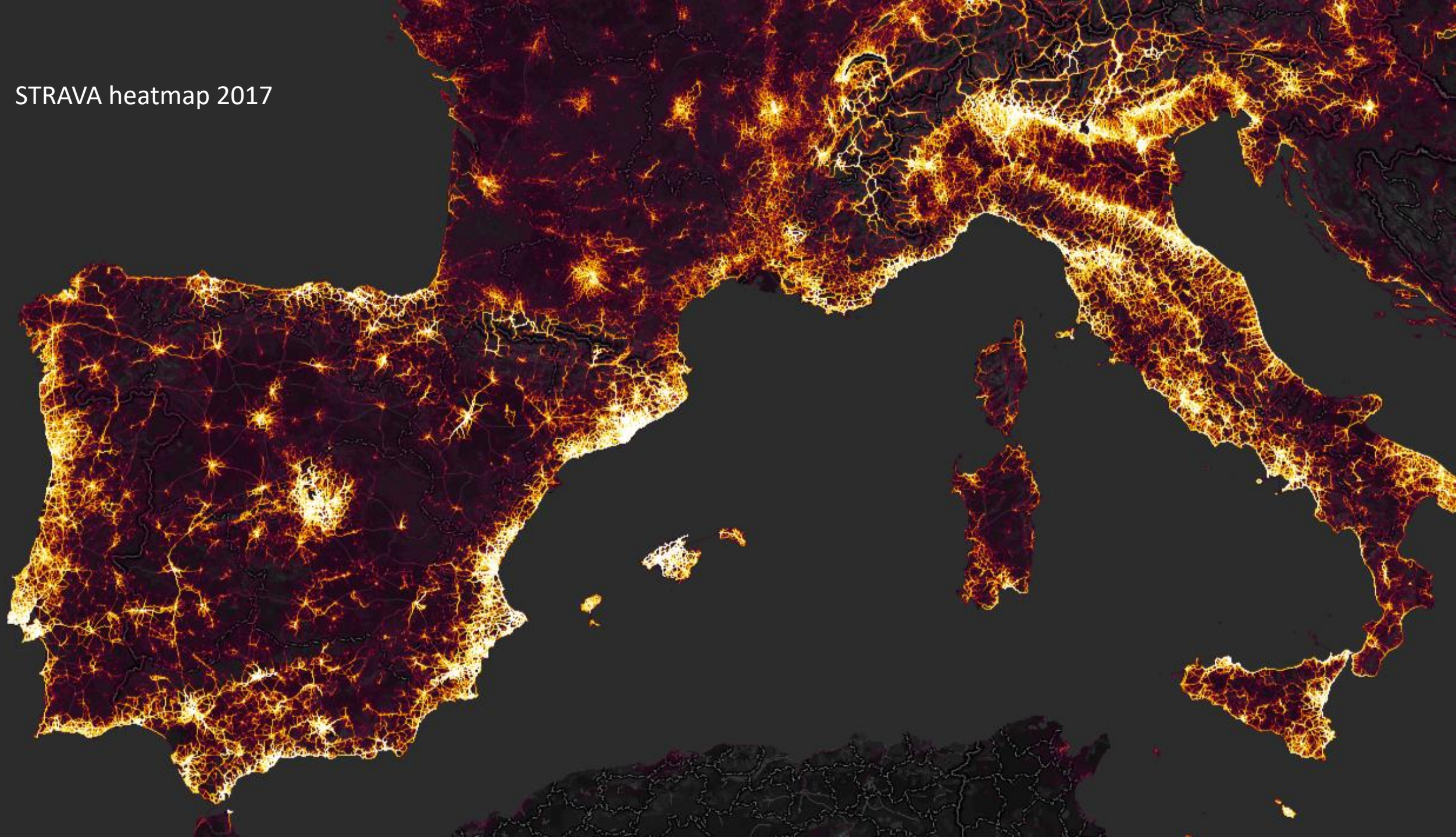
... but mainly at a **local scale**.

**Results** also,  
**depends** on **Popularity** of each Social Media / Web share Services & Sports'APP

... that varies according to **cultural, SOCIAL**, and **demographic** factors

**¿Representation?**

STRAVA heatmap 2017



# ZOOMING OUT... Case Study 2



## ➤ “On Wheels” & “On Foot”

- 32.466 individual tracks
- of which 27.949 crossed the study area

➤ **19.217** tracks

➤ **2.842** users

➤ 2006 ~2017

Lisbon  
Metropolitan  
Area

**2.8 M**  
inhabitants

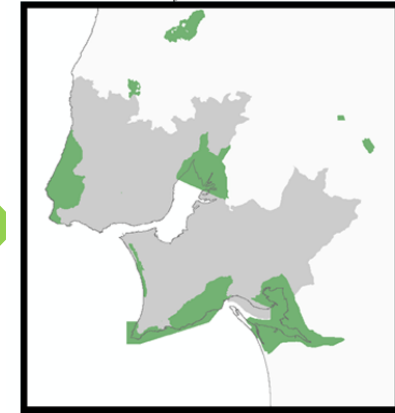
+

**2 Natural Parks**

1 Protected Landscape  
2 Natural Reserves

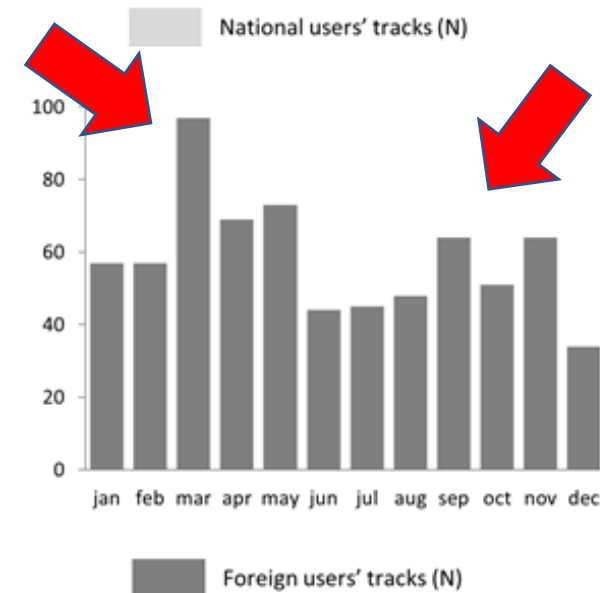
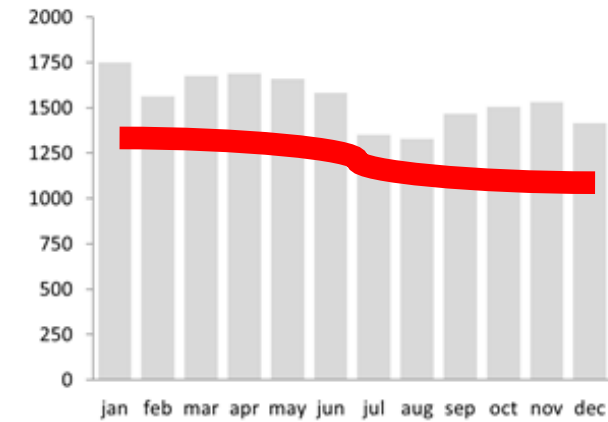
+

... few SMALL  
recreational areas

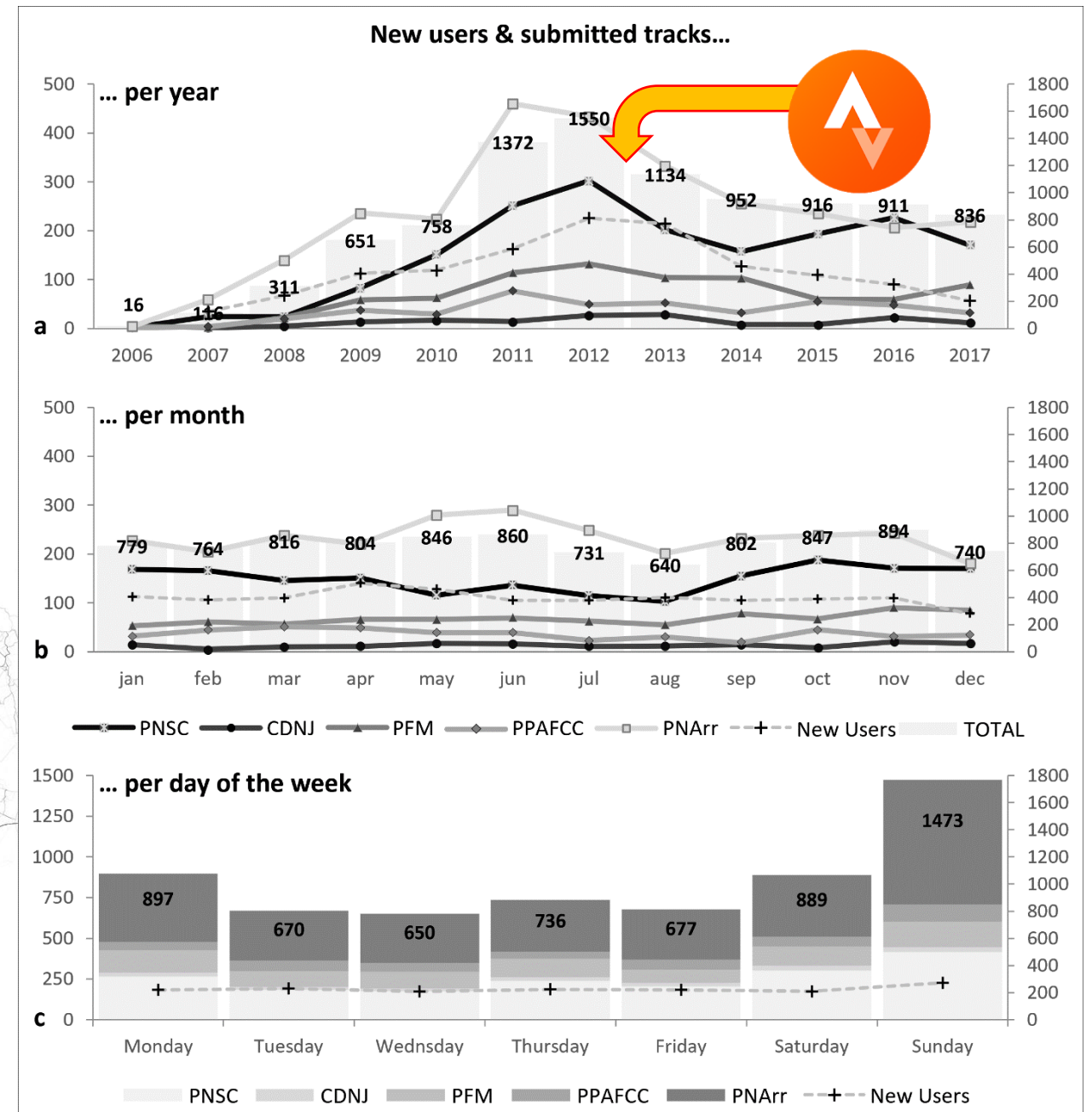


# Results

Activity	Tracks	Users
Hiking	1049 (5%)	376 (9%)
Running	1296 (7%)	376 (9%)
Walking	693 (4%)	243 (6%)
Cycling	2845 (15%)	755 (18%)
Mountain biking	9407 (49%)	1637 (39%)
Pacing bike	3927 (20%)	177 (19%)
Total	19217	2842*

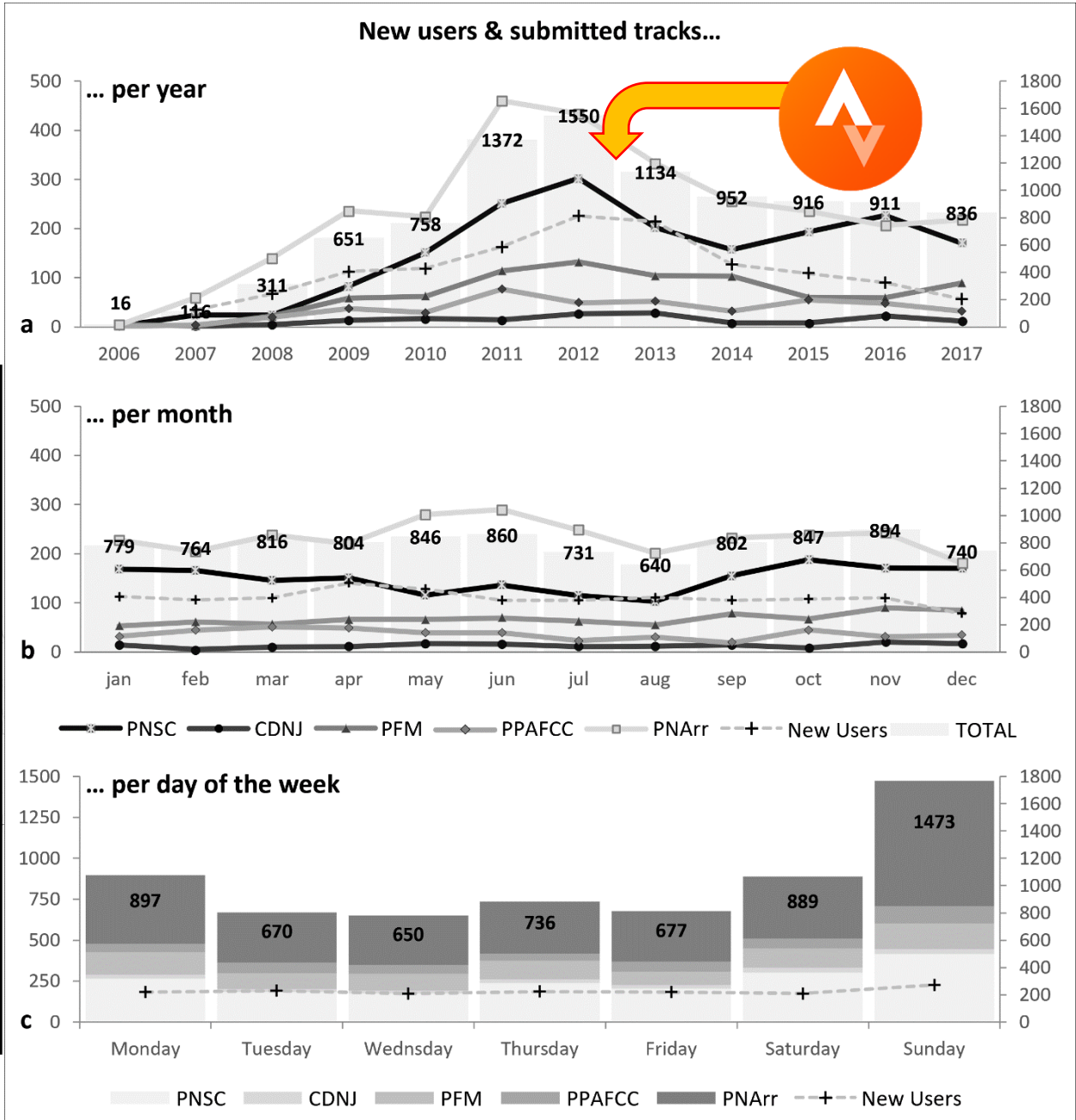
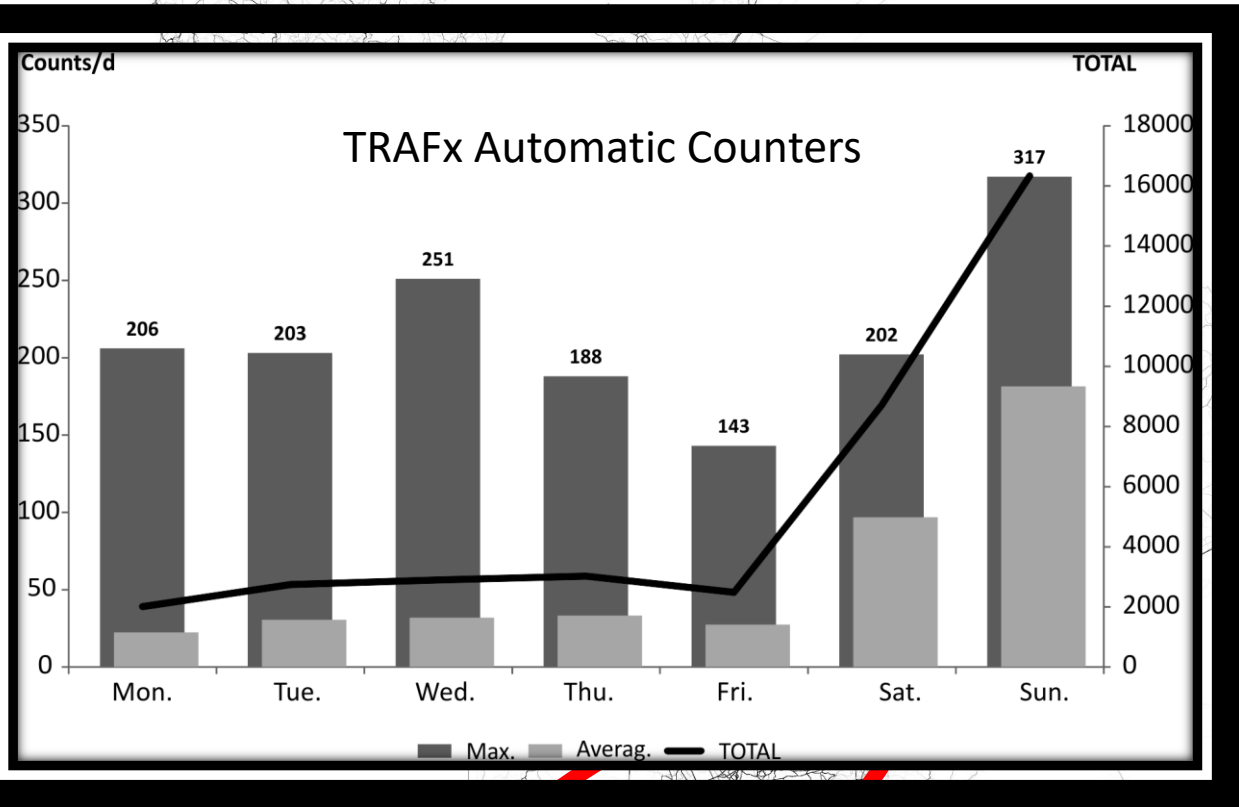


# Mountain biking (P95 n=9523)

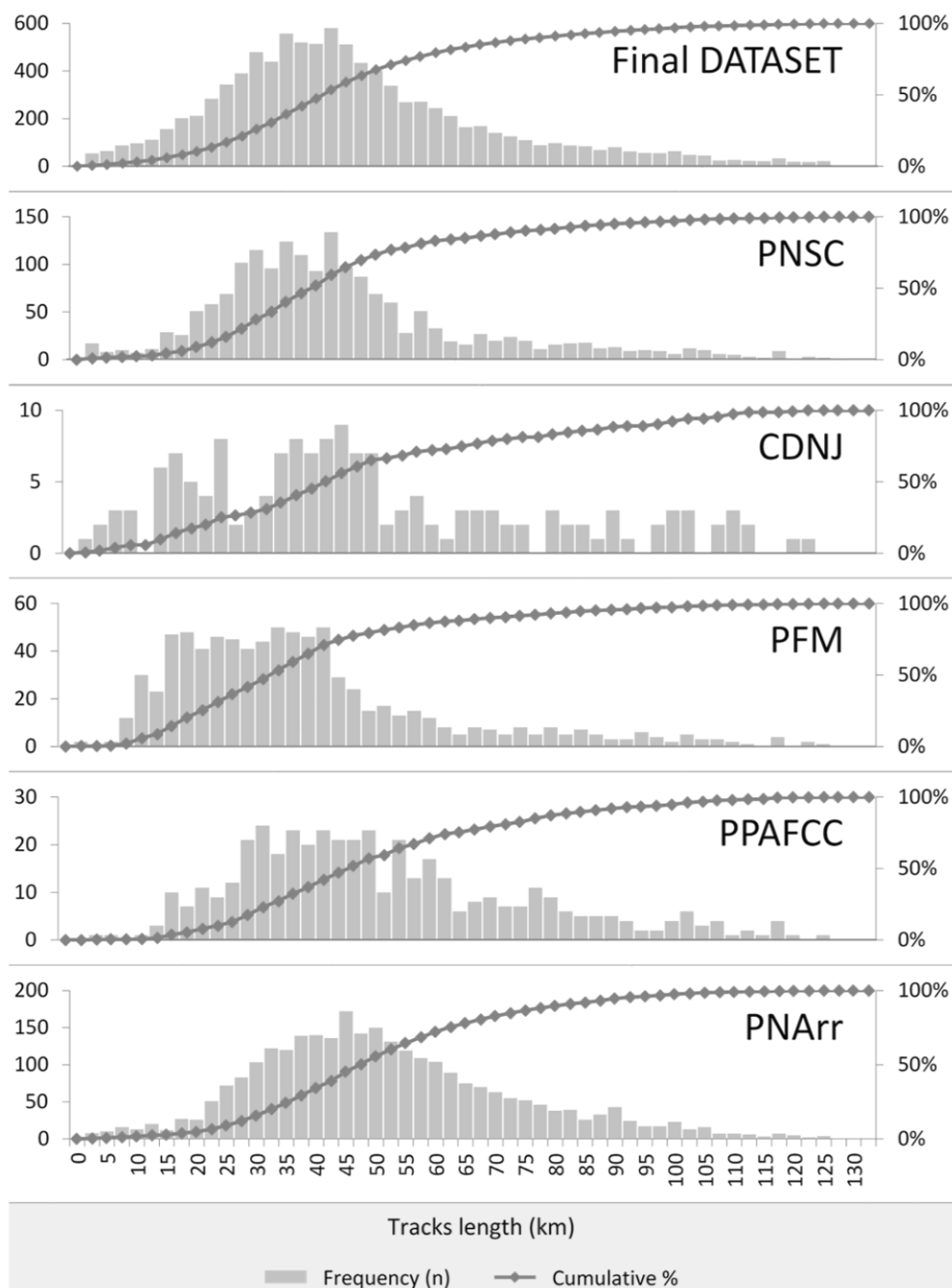


# Mountain biking

(P95 n=9523)



## Track lengths histograms



9523 trk  
(8664)  
**1319 users**

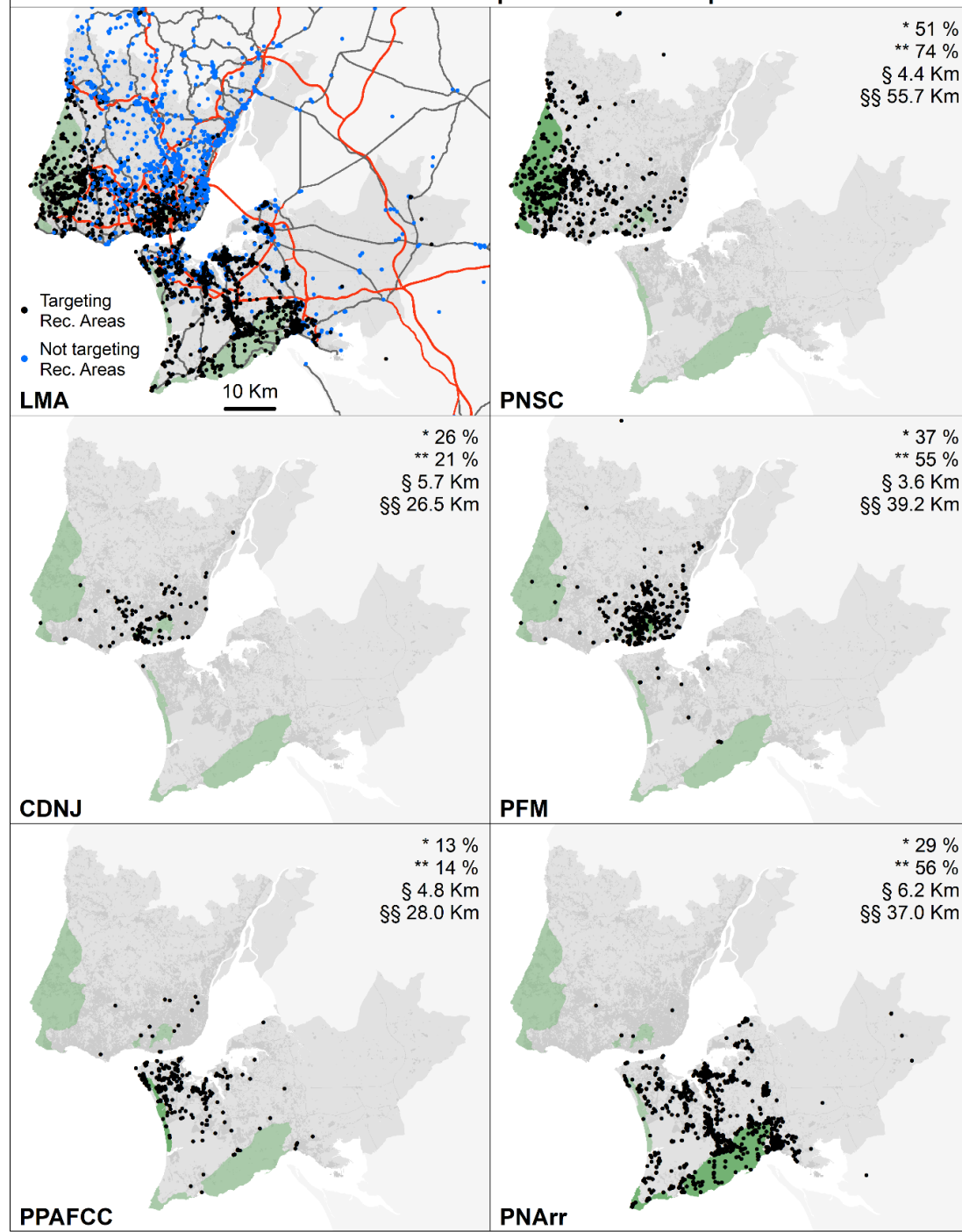
6.57  
trk/user

80,77%  
round trips

Avg Length  
44,87 km  
(+/- 22.93 km)

**60,57% trk**  
directly  
TRAGET  
**10% LMA**

## MTB rides of Lisbon Metropolitan Area start points



# Cross-riding analysis of Mountain biking use within LMA's

Riders from ...

that also ride ...

	<b>PNSC</b>	<b>CDNJ</b>	<b>PFM</b>	<b>PPAFCC</b>	<b>PNArr</b>	<b>OutRec&amp;PA</b>
	<b>440</b>	<b>91</b>	<b>288</b>	<b>157</b>	<b>444</b>	<b>833</b>
<b>PNSC</b>	-	67%	48%	41%	32%	29%
<b>CDNJ</b>	14%	-	25%	15%	8%	7%
<b>PFM</b>	31%	79%	-	35%	22%	21%
<b>PPAFCC</b>	15%	25%	19%	-	24%	11%
<b>PNArr</b>	32%	37%	34%	68%	-	27%
<b>OutRec&amp;PA</b>	55%	66%	61%	59%	52%	-

# Comparing Metropolitan & Rural context...

## Case Study 3



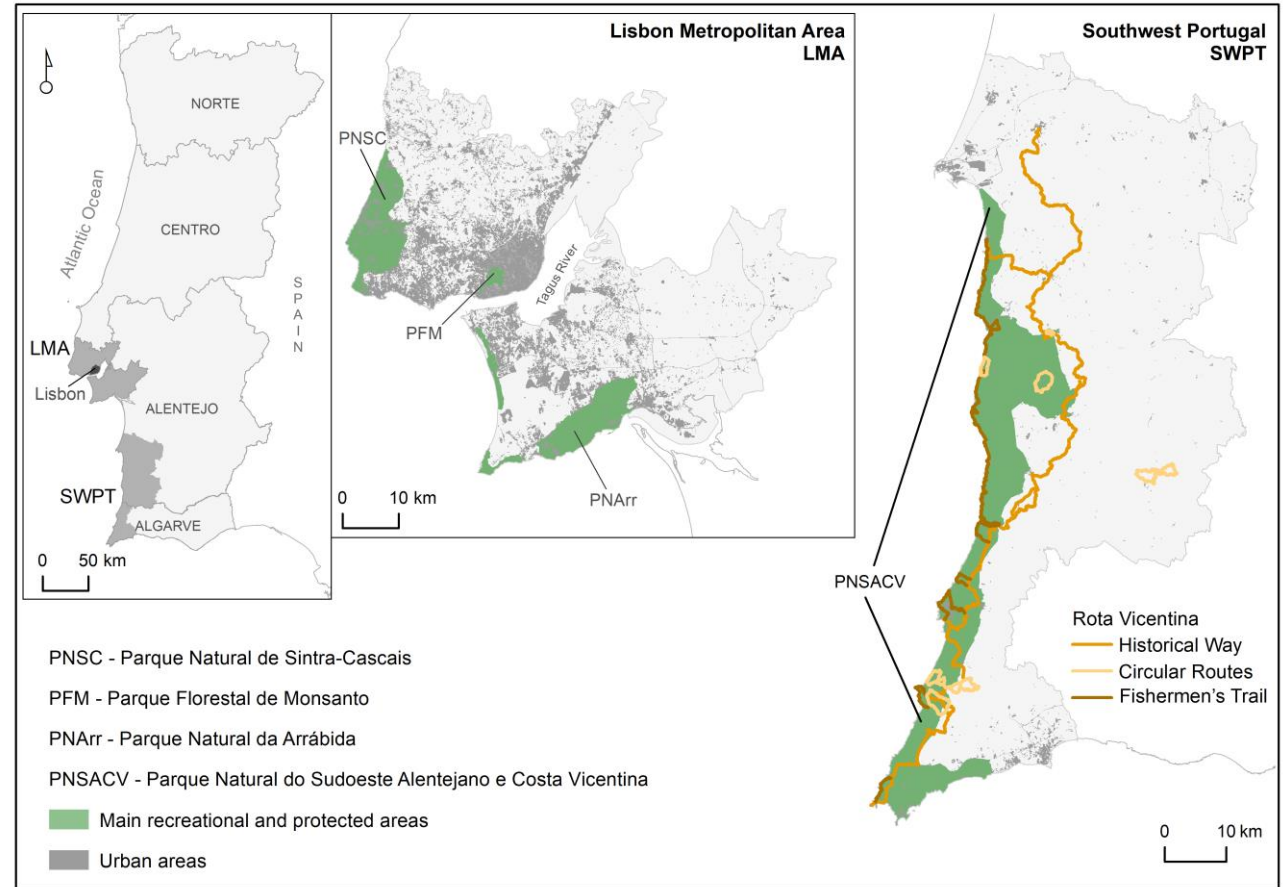
SATRTPOINT

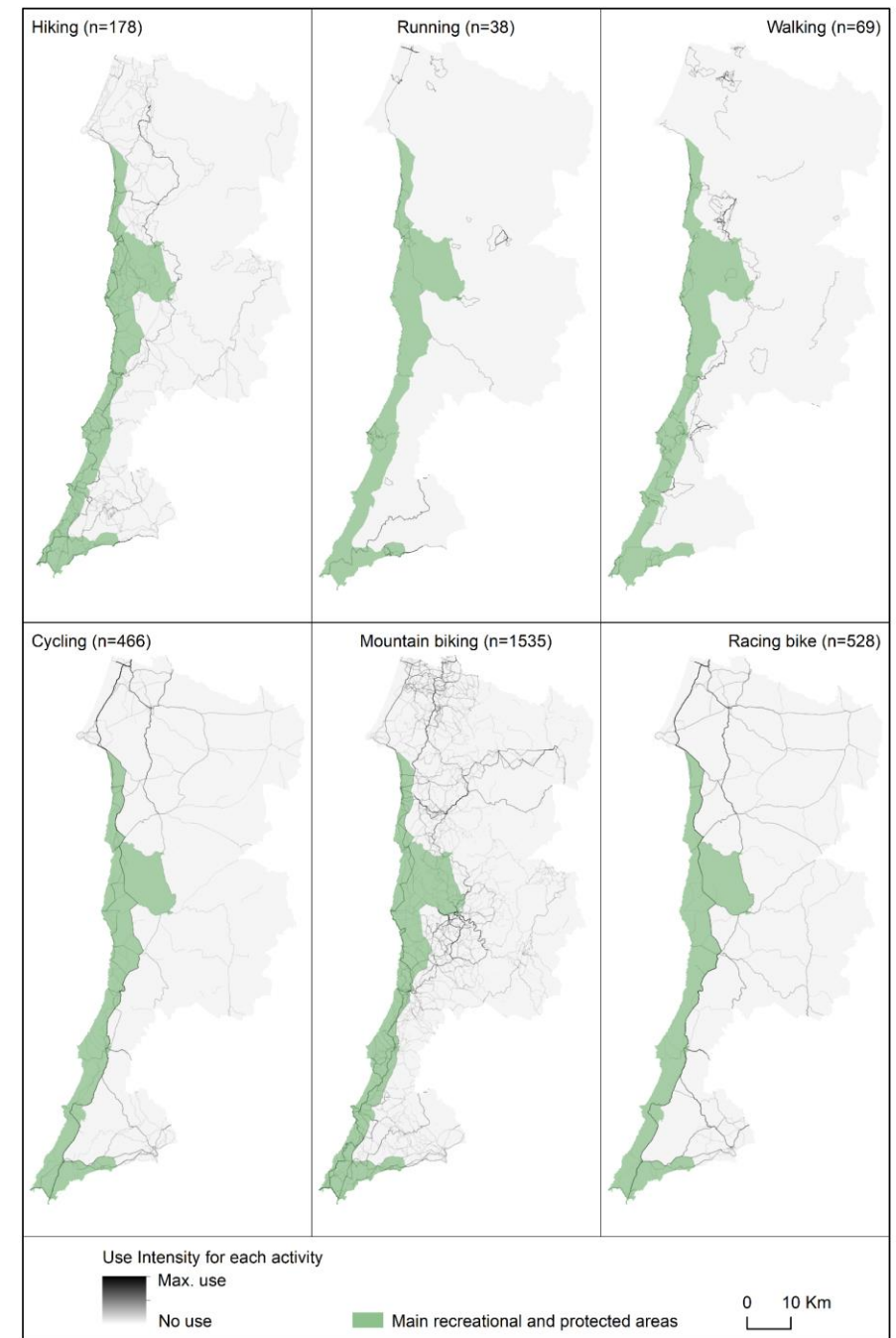
➤ “On Wheels” & “On Foot”

➤ **19.217 + 2.814**  
tracks

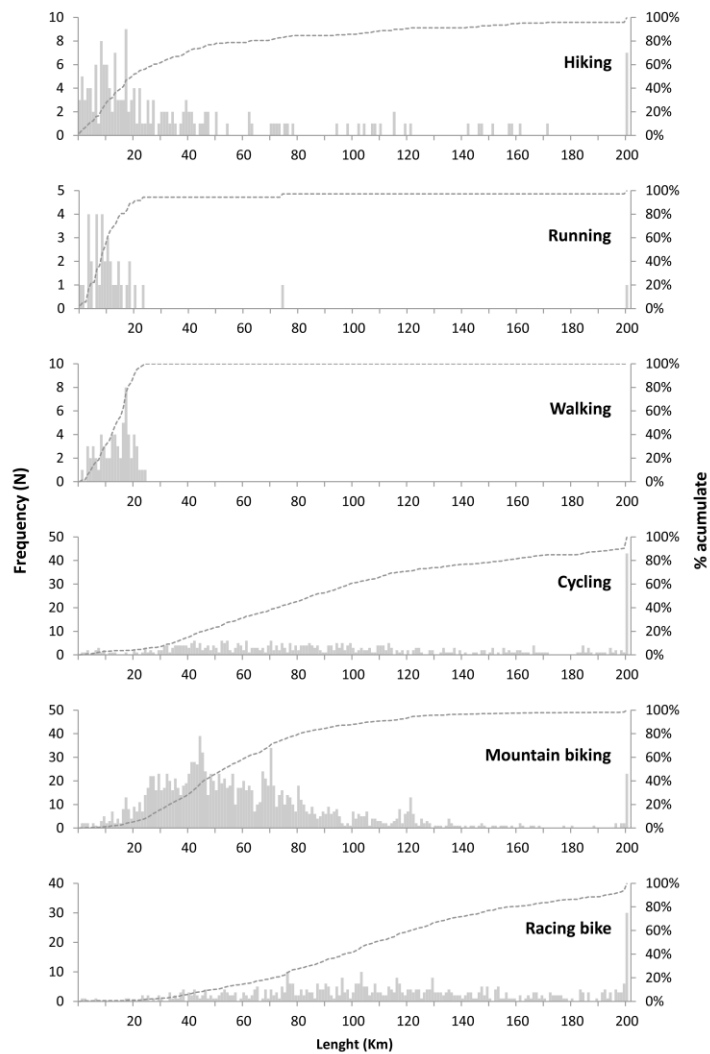
➤ **2.842 + 798**  
users

➤ 2006 ~2017



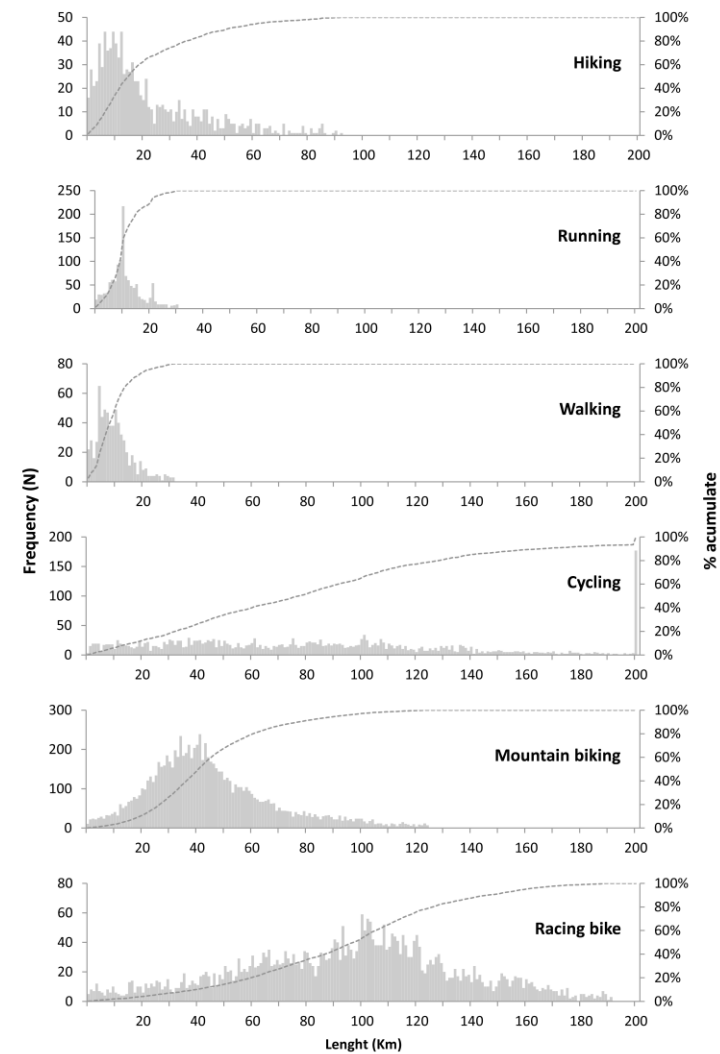


Activities Length Histograms for SW Portugal (P95)



Frequency % acumulate

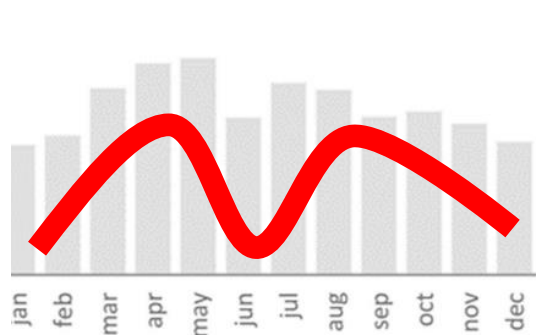
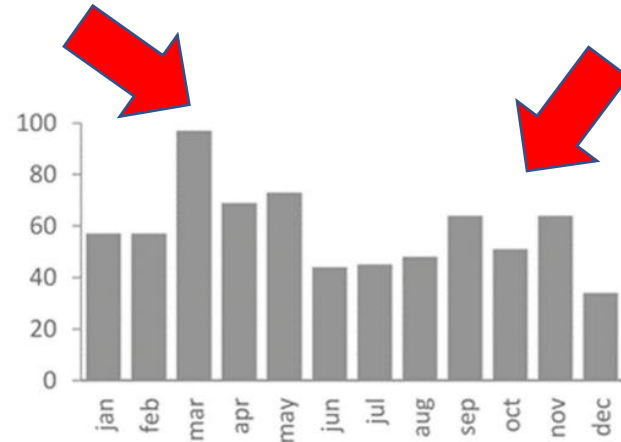
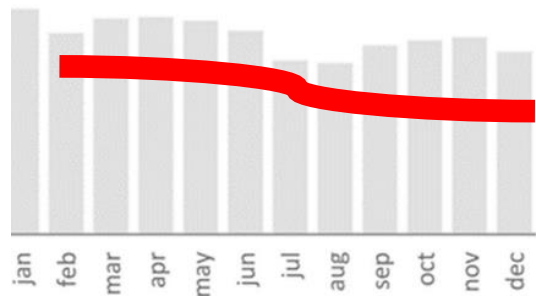
Activities Length Histograms for Lisbon Metropolitan Area (P95)



Frequency % acumulate

# Quick results...!

LMA

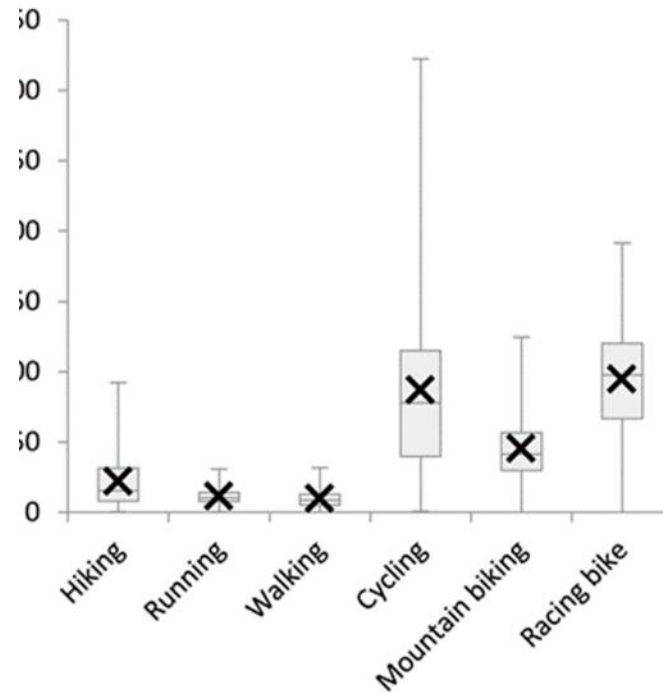


National users' tracks (N)

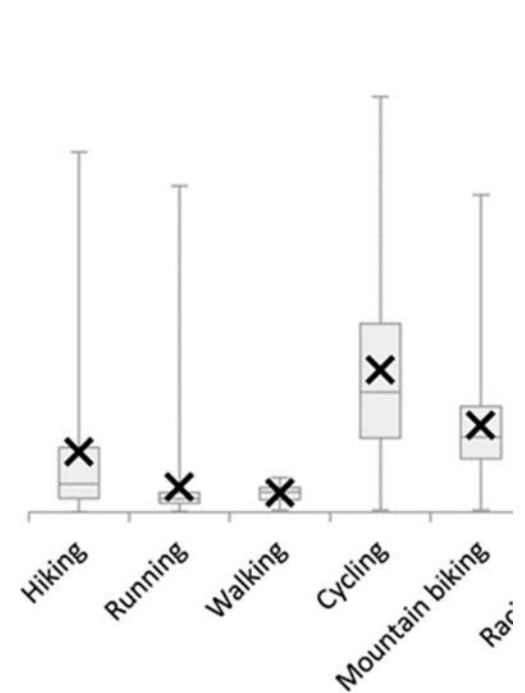
Foreign users' tracks (N)

Southwest Portugal

Lisbon Metropolitan Area (P95)



Southwest Portugal (P95)



# Users' engagement by activities in GPSies.

## Activities

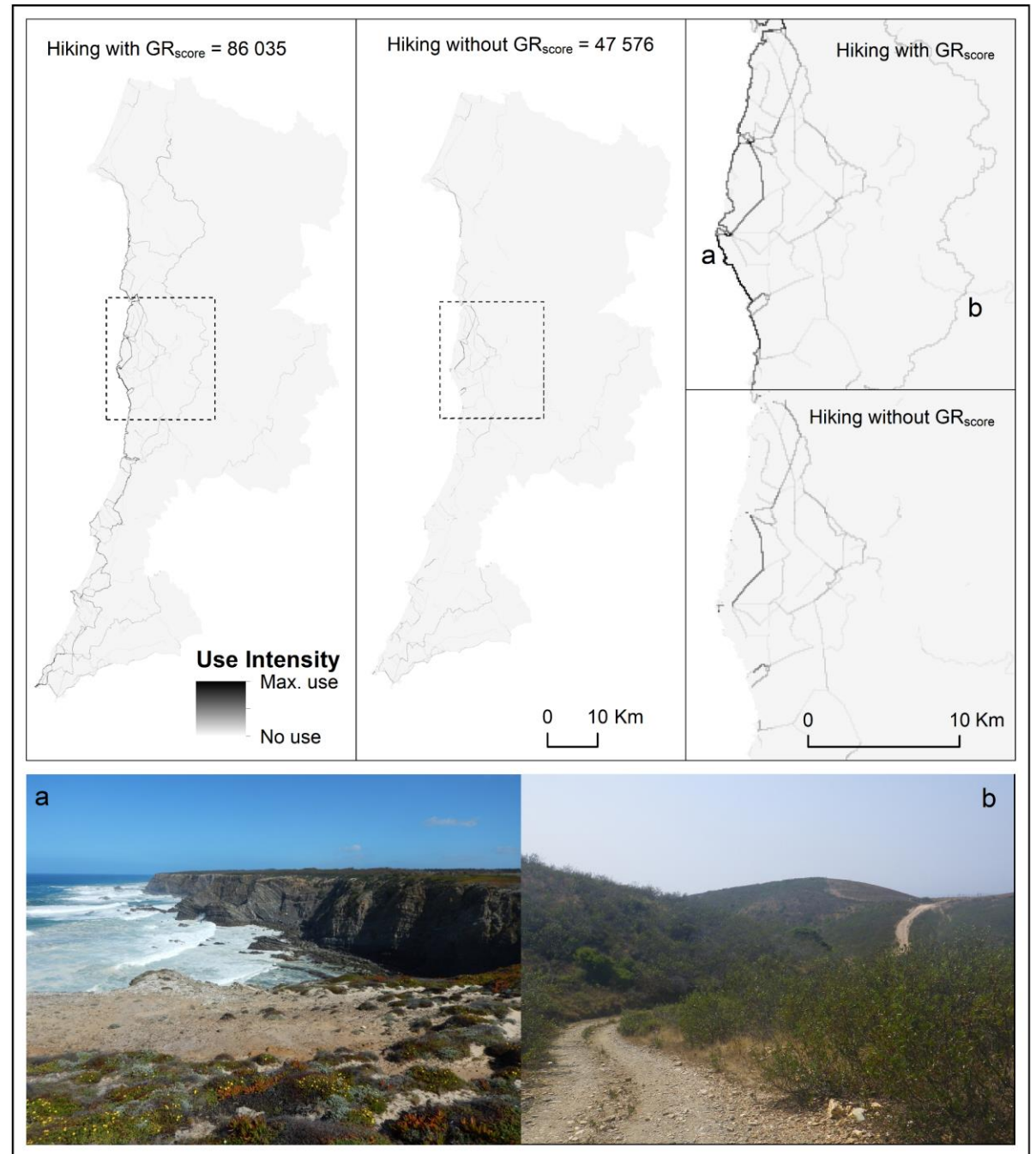
Activities	Users' (Stated) Favourite Activity	Tracks Upload to GPSies from These Users	Average Tracks per User
Hiking	256	6974	27.24
Running	176	4013	22.80
Walking	110	2293	20.85
Cycling	446	22,361	50.14
Mountain biking	1236	29,400	23.79
Racing bike	464	18,955	40.85
None	556	3956	7.12
Others	53	952	17.96
Total	3297	88,904	26.97

# Evaluating the Attractiveness of Outdoor and Adventure Products

		Hiking	Running	Walking	Cycling	Mountain Biking	Racing Bike	Total
Total Score	with GR	86,035	7310	12,622	380,028	1,062,444	468,650	2,017,089
	without GR	47,576	5387	6238	352,898	855,894	452,639	1,720,632
	GR weight	45%	26%	51%	7%	19%	3%	15%
National Score	with GR	52,054	2479	9344	262,042	995,417	404,482	1,725,818
	without GR	37,738	1178	4661	247,156	799,493	391,513	1,481,739
	GR weight	28%	52%	50%	6%	20%	3%	14%
Foreign Score	with GR	33,981	4831	3278	117,986	67,027	64,168	291,271
	without GR	9838	4209	1577	105,742	56,401	61,126	238,893
	GR weight	71%	13%	52%	10%	16%	5%	18%

Conformity of activities in the SWPT with the Grand Route Rota Vicentina measured by score use (number of pixels weighted by the number of tracks that crosses each spatial unit)

... YES we CAN...!



# Monitoring outdoor recreational uses through our collective digital footprint

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